Defensive and flying behaviour in *Sipyloidea* sp. (PSG 103).

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Further to my article concerning the push-back fright response of this and other species (Bradburne, 1992), I have seen *Sipyloidea* sp. on several occasions extend this movement into an actual backward "jump", assisted by a downward abdominal thrust, as the insect wriggles to escape. This action tends to lead to flight, especially in the males.

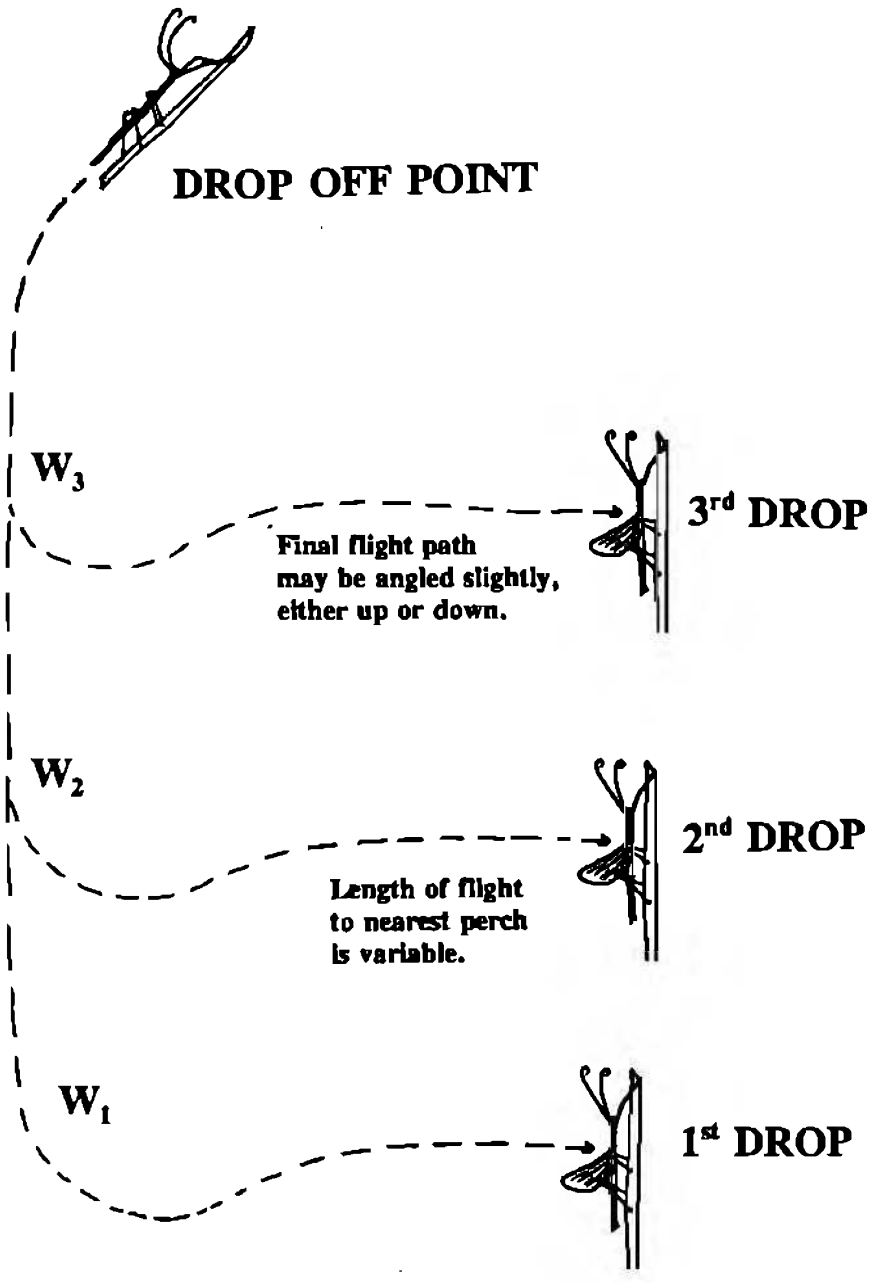

Figure 1. Flight paths of male PSG 103 after successive drops. Wings are opened at points W_1, W_2 or W_3.

Unlike Diptera and the lacewings (Neuroptera), the jump is not immediately followed by the wings opening, but by a period of free fall. This is probably due to the large size of the insects' wings in comparison with the size of their flight muscles. This slow opening therefore tends to result in the males dropping at least 30cm before deploying their wings. It is interesting to note however that subsequent disturbances, if done in rapid succession, cause the insect to fall less and less distance before opening their wings (Fig. 1). Possibly this is due to their wings being more prepared for flight because they have flown only moments ago. It is likely that when resting the wings are in a fully folded state, but soon after flight they are only partially folded away and so better prepared for take off again.

If the insect has less than 30cm to drop, it simply falls to the floor. Obviously this is a safe distance to fall and would save energy in the wild where the insect could simply catch hold of a slightly lower branch without resorting to flight.

Unlike most of the species in culture, the female PSG 103 is an active flier, and does so quite often (especially when you don't expect it to!), although much less frequently than the males. They will even, if stressed for some reason, take off on their own accord; this generally only happens after dusk. Although they tend to drop slightly at first, especially when egg laden, they are certainly capable of upward flight over several metres (Fig. 2).

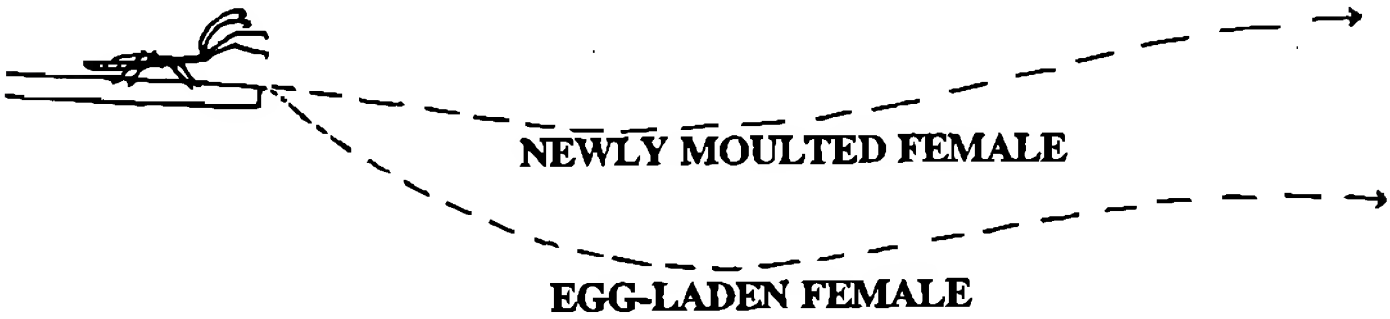

Figure 2. Flight path of female after take off from a level surface.

The males, far from being clumsy flappers like males of *Heteropteryx dilatata*, are expert fliers. They easily manage to dodge around obstacles, such as people trying to catch them, and I have even seen one hover for over a second when I held my hand above it, blocking its path. Often I have seen them circle upwards in flight around the central light in my bedroom. This may be a moth-like response, allowing long distance navigation by the moon when in search of mates in the wild. Certainly the very long antennae, almost as long as the body, could be highly sensitive chemoreceptors, and perhaps able to pick up any females' pheromones from some distance away. The males do not have ocelli, so this directional response cannot be due to these simple light / dark sensors.

Take off from a level surface in this species seems to follow a particular pattern. If they decide to take off by themselves, they will first adopt a very erect stance with their body well raised off the ground, presumably to give them more room for their first downbeat (This, I think, is why *Extatosoma tiaratum* males cannot take off from the ground, their legs have become too short in order to assist with camouflage). Then, while waving their antennae slowly up and down, and often looking left and right, they rear up so that their head is higher than their abdomen and their front two legs are lifted off the ground (Fig. 3). They remain in this position for several seconds. If they decide not to fly they will either bring their fore legs in beside their head and become stationary, as is often seen in *Carausius morosus*, or they will simply put their legs down and walk away.

If they do decide to fly, just before take off, the maxillary palps will spread out, just as they do when the insect is "tasting" its food when feeding. Then, possibly with a small jump, they take off. The insects always fly with their legs splayed out, presumably to be able to catch onto the

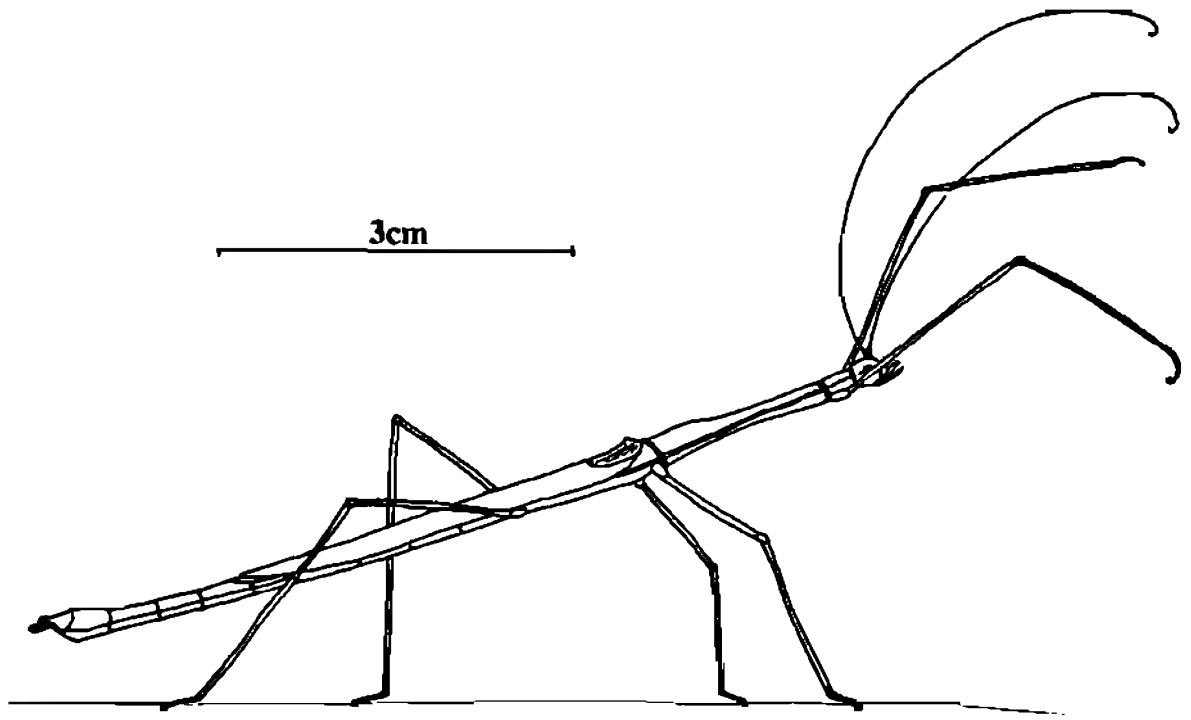

Figure 3. Take off stance of PSG 103.

chosen branch most easily. They also open and splay out their last two abdominal segments so that they are spread out in a similar way to when the insects are copulating. This seems a strange thing to do , and as yet I cannot see any sensible reason for this behaviour. I have seen the same posture of the abdomen on one other occasion, performed by a solitary male sitting on a branch one evening after dark. He remained in this position for at least 15 minutes, with the green feathery fringes inside the tip of the abdomen filled with haemolymph (hence the colour) and gently pulsating. Could this be another way of picking up female pheromones? I have only observed this once in a stationary insect.

Perhaps the most startling flying achievement that I have witnessed to date was a pair of *Sipyloidea* sp. copulating in flight! The male took no part in the flying, merely staying perched on the female's back throughout. This happened some time after dark when the temperature was around 24°C. I opened the cage door and disturbed a mating couple resting on the glass. To my surprise, instead of falling to the floor, the female started flapping her wings and managed a one metre long downward flight at about 40° from the horizontal; no mean feat, considering the extra weight she was carrying! The pair remained joined together even as I returned them to their cage.

It would be interesting to know whether other similar species such as PSG 4 and PSG 89 exhibit similar flight patterns to PSG 103, or if such behaviour is species specific.

Reference

Bradburne, R.P. (1992) Some observations on the defensive behaviour of various species. *PSG Newsletter*, **50**: 11.